CSE341 – Programming Languages 2023 FALL
Homework 3 Report

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In this homework assignment I have tried to complete but I encounter with some errors in part 1. Since I couldn't handle those errors I did not start to the second part. In this document I mentioned about my code and those errors briefly.

Last situation of the code is I can calculate math ops like (+ 4b2 3b2) and define functions. Also, I can call them but there are errors I mentioned below.

I have included necessary libraries and defined necessary functions as seen below.

```
%{
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

#define MAX_FUNCTIONS 100 // Preprocessor directives for setting the maximum number of functions and parameters.
#define MAX_PARAMS 3

// Struct to represent a function in the G++ language.
typedef struct {
    char functionName[50];          // Name of the function.
    char* parameters[MAX_PARAMS];   // Parameters for the function.
    char body[200];                 // Body of the function as a string.
} Function;


Function functionTable[MAX_FUNCTIONS]; // Function type table to store defined functions by user
int functionCount = 0; // Counter to keep track of the number of functions defined.

extern int yylex(); // External declarations for functions provided by Flex.
extern char* yytext;
extern int yylineno;
void yyerror(const char *s); // Error handling function declaration.
char* getResult(char* s1, char* s2, char opA); // Function to calculate operation results with VALUEF type
void printExpResult(char* fractionResult); // Function to print expression result.
void defineFunction(char* functionName, char* arg1, char* arg2, char* arg3, char* body);  // Function to storing operations a new defined function
char* callFunction(char* functionName, char* arg1, char* arg2, char* arg3); // Function to call a previously defined function
%}


%union{
  char* string;
}
//KW TOKENS
%token KW_AND
%token KW_OR
%token KW_NOT
%token KW_EQUAL
%token KW_LESS
%token KW_NIL
%token KW_LIST
%token KW_APPEND
%token KW_CONCAT
%token KW_SET
%token KW_DEF
```

In this syntax I aimed to keep passed tokens and non-terminals as strings so that it would be easy for parsing and other operations.

After I have defined necessary tokens and symbols, I tried to define syntax for symbols. Probably I made mistakes in there (below image).

```
%token OP_DIV
%token OP_MULT
%token OP_OP
%token OP_CP
%token OP_COMMA

//Comment TOKEN
%token COMMENT

//VALUEF TOKEN
%token <string> VALUEF

//Identifier TOKEN
%token <string> IDENTIFIER
// Non-terminal symbols
%type <string> EXP
%type <string> FUNCTION
//  Start symbol
%start START

%%
//Rules for non-terminal symbols
START: EXP {printExpResult($1);}
      |FUNCTION
      |COMMENT {;}
      |OP_OP KW_EXIT OP_CP {exit(0);}
      ;

EXP: OP_OP OP_PLUS EXP EXP OP_CP {$$ = getResult($3,$4,'+');}
    |OP_OP OP_MINUS EXP EXP OP_CP {$$ = getResult($3,$4,'-');}
    |OP_OP OP_MULT EXP EXP OP_CP {$$ = getResult($3,$4,'*');}
    |OP_OP OP_DIV EXP EXP OP_CP {$$ = getResult($3,$4,'/');}
    |OP_OP IDENTIFIER EXP OP_CP { $$ = callFunction($2, $3, NULL, NULL); }
    |OP_OP IDENTIFIER EXP EXP OP_CP { $$ = callFunction($2, $3, $4, NULL); }
    |OP_OP IDENTIFIER EXP EXP EXP OP_CP { $$ = callFunction($2, $3, $4, $5); }
    |IDENTIFIER {$$ = strdup($1);}
    |VALUEF {$$ = strdup($1);}
    ;

FUNCTION: OP_OP KW_DEF IDENTIFIER EXP OP_CP  { defineFunction($3, NULL, NULL, NULL, $4); }
        | OP_OP KW_DEF IDENTIFIER IDENTIFIER EXP OP_CP { defineFunction($3, $4, NULL, NULL, $5); }
        | OP_OP KW_DEF IDENTIFIER IDENTIFIER IDENTIFIER EXP OP_CP { defineFunction($3, $4, $5, NULL, $6); }
        | OP_OP KW_DEF IDENTIFIER IDENTIFIER IDENTIFIER IDENTIFIER EXP OP_CP  { defineFunction($3, $4, $5, $6, $7); }
        ;
```

Since I wrote 4 helper functions, I did not add their images to the report if I put all images that would be unnecessary and make the report complex. In my opinion, my helper functions are okay but not above images. However, I couldn't understand the error in them. Following images show the errors that I am getting.

When I enter a valid input for the first time there is no problem. However, if I call a valid input again(even it is the same expression) I get syntax error for it. If I try to calculate a fraction operation there is no problem. It gives the result. Also, if I try to define a function it defines it and prints #Function as in syntax.

Because I am getting error in second valid input I couldn't try to call function. When I tried to give function definition manually and call it from terminal I get format errors. Added images at the end.

When I enter something which is not in the syntax it gives syntax error without any problem. Examples are in the below first image's last section.

HW3 > gpp_interpreter.y

```
1  %{
2    #include <stdio.h>
3    #include <stdlib.h>
4    #include <string.h>
5
6    #define MAX_FUNCTIONS 100 // Preprocessor directives for setting the maximum number of functions and parameters.
7    #define MAX_PARAMS 3
8
```

PROBLEMS 22 OUTPUT DEBUG CONSOLE TERMINAL PORTS bash - HW3

```
celik@celik:~/Homeworks/PL/HW3$ make
yacc -d gpp_interpreter.y
lex -o gpp_lexer.c gpp_lexer.l
cc -g gpp_lexer.c y.tab.c -ll -o gpp_interpreter.out
celik@celik:~/Homeworks/PL/HW3$ ./gpp_interpreter.out
G++ Interpreter
(+ 4b8 6b8)
5/4
(- 4b1 5b1)
Error: syntax error at line 1
celik@celik:~/Homeworks/PL/HW3$ ./gpp_interpreter.out
G++ Interpreter
(+ 4b8 6b8)
5/4
(+ 4b8 6b8)
Error: syntax error at line 1
celik@celik:~/Homeworks/PL/HW3$ ./gpp_interpreter.out
G++ Interpreter
(def sum x y(+ x y))
#Function
(sum 4b8 6b8)
Error: syntax error at line 1
celik@celik:~/Homeworks/PL/HW3$ ./gpp_interpreter.out
G++ Interpreter
(sum 4b8 6b8)
Call function called
Error: Function sum not defined
Segmentation fault
celik@celik:~/Homeworks/PL/HW3$ ./gpp_interpreter.out
G++ Interpreter
123
SYNTAX_ERROR 123 cannot be tokenized
3422
SYNTAX_ERROR 3422 cannot be tokenized
(- 4b1 5b1)
-1/1
(- 4b1 5b1)
Error: syntax error at line 1
celik@celik:~/Homeworks/PL/HW3$
```

```
celik@celik:~/Homeworks/PL/HW3$ ./gpp_interpreter.out
G++ Interpreter
(sum 4b8 6b8)
Call function called
Error: Invalid fraction format '+ x y'
(sum 4b8 6b8)
Error: syntax error at line 1
```

```
celik@celik:~/Homeworks/PL/HW3$ ./gpp_interpreter.out
G++ Interpreter
(sum 4b8 6b8)
Call function called
Error: Invalid fraction format '(+ x y)'
```

```
celik@celik:~/Homeworks/PL/HW3$ ./gpp_interpreter.out
G++ Interpreter
(sum 4b8 6b8)
Call function called
Error: Invalid fraction format '( + x y )'
```